

**MODULAR DECK STRUCTURE****FIELD OF THE INVENTION**

5 This invention relates to general deck construction. More particularly, it concerns a structure and a kit for building a modular structure having to support a plurality of flagstones to form a deck structure.

**BACKGROUND OF THE INVENTION**

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Decks, patios and terraces are all very popular structures among owners of houses or other types of lodging. These structures are typically adjoined to houses and are host to many activities, receptions, meetings and other social activities. One can sit down or lay down on patio furniture to relax or to discuss between friends. In fact, these structures are used very often during summer time and even year round. That is why it is important to have a solid structure that will last long and will be resistant to different climates. Since they can be very costly to build, it is also very important that these structures keep their original look as long as possible. Moreover, the look of the structure is also very important, as it will stand up for many years.

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Traditionally, decks, terraces or raised patios are made all in wood, all in plastic or all in concrete. It is difficult to combine wood and concrete for forming a resistant, easy to assemble and nice looking patio. Building these prior art patios is not an easy task for someone who is not an expert in construction. Effectively, a deck structure is essentially composed of wooden framing members, like border, transverse and cross planks. The surface of the deck is also covered with wooden panels providing the flooring of the deck. These panels and the planks have to be cut according to predetermined dimensions to fit together. Planning the construction of the patio deck and building it are very time consuming. Furthermore, to complicate the matters, the different components needed to assemble the patio deck are often sold separately.

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Almost the same issues arise for the construction of concrete decks. Moreover, frameworks have to be built before the pouring of the concrete itself. The size and shape of the frameworks have to be planned in advance and it is not an easy task to build them. After the concrete is poured, one has to wait until the concrete is hardened and cured before being able to use the deck for different activities. Moreover, the different components needed to assemble the deck can be very bulky, thus pretty difficult to be carried by car.

Also known in the art is US Patent 4,628,645 (ROMAN) disclosing a modular patio construction comprising a frame defining a plurality of cells adapted to receive a plurality of flagstones of fixed dimensions. The planks forming the frame have a ledge being L-shaped for supporting the flagstones within the cells. The cells are delimited by transverse and cross planks fixed within the frame. The frame, the cross and transverse planks together form a module. A number of modules can be assembled together side-by-side to form a patio construction.

However, a drawback to the modular patio construction of US Patent 4,628,645 is that since the ledges of the frame, cross and transverses planks are L-shaped, there is a risk of water accumulation in the corners of the ledges. During and after a rain shower, the water is not automatically drained by gravitational force from between the planks and the flagstones. This situation can result in structural damages to the module. Actually, the accumulation of water can weaken the strength of the ledge. The planks can even rot. The lifespan of the module is thus considerably reduced.

Another drawback is that constraints are applied to the corner of the ledges by the weight of the flagstones on these ledges. Again, these constraints can result in structural damages to the module.

Also known in the art are US Patents 3,504,472 (CLEMENT); 4,622,792 (BETTS); 4,628,645 (TAFELSKI); 4,999,964 (TAYLOR); 5,361,554 (BRYAN); 5,363,614 (FAULKNER); and 6,209,267 (DANTZER) which provide examples of modular structures for forming a patio deck.

A drawback of the modular patio constructions of the prior art is that they are often difficult to assemble and require that the user have good skills in construction, and more particularly in patio construction.

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Thus, there is still presently a need for an easy way to build patio constructions that would simplify the process of building a deck.

### SUMMARY OF THE INVENTION

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An object of the present invention is to provide a modular deck structure that satisfies the above-mentioned need.

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Accordingly, the present invention relates to a modular deck structure which comprises an open frame with interconnected crisscross framing members defining a plurality of polygonal cells. Each of the cells comprises a top, a bottom and an inner wall delimiting an opening. The inner wall comprises a sloping portion. The modular deck structure also comprises a plurality of flagstones with side edges. Each of the flagstones is sized and shaped to adjustably fit within a respective one of the cells. The sloping portion drains water out of the open frame to prevent water accumulation between the side edges of the flagstones and the inner walls.

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The present invention also relates to a kit for assembling a modular deck structure. The kit comprises framing members being connectable to one another in order to form an open frame having a plurality of polygonal cells. Each of the cells comprises a top, a bottom and an inner wall delimiting an opening. The inner wall comprises a sloping portion. The kit also comprises a plurality of flagstones with side edges. Each of the flagstones is sized and shaped to adjustably fit within a respective one of the cells. The sloping portion drains water out of the open frame to prevent water accumulation between the side edges of the flagstones and the inner walls.

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Preferably, both the previous modular deck structure and the kit for assembling the same also comprise conforming means for conforming the side edges of the flagstone to the sloping portion of the respective cell, thereby allowing each of the flagstones to sit properly on the sloping portion of the cell.

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The present invention also relates to a modular deck structure which comprises an open frame with interconnected crisscross framing members defining a plurality of polygonal cells. Each of the cells comprises a top, a bottom and an inner wall delimiting an opening. The inner wall comprises a sloping portion. The modular deck structure also comprises a plurality of flagstones with side edges. Each of the flagstones is sized and shaped to adjustably fit within a respective one of the cells. The modular deck structure also comprises conforming means for conforming said side edges of the flagstone to the sloping portion of the respective cell, thereby allowing each of said flagstones to sit properly on said sloping portion of the cell. The sloping portion drains water out of the open frame to prevent water accumulation between the side edges of the flagstones and the inner walls.

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Preferably, the deck further comprises vertical support posts connected to the module to support the same in a raised position.

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Preferably, the deck is made with a plurality of modular deck structures interchangeable with each other, thereby providing a modular and easy-to-assemble patio construction. The modules may consist of prefabricated single piece structures. However, in accordance with a preferred aspect of the invention, the modules are made of interconnectable individual framing members.

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A modular deck structure construction according to the invention makes it very easy and fast for any non handy person to build a nice looking deck made with flagstones.

### BRIEF DESCRIPTION OF THE DRAWINGS

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These and other objects and advantages of the invention will become apparent upon reading the detailed description and upon referring to the drawings in which:

Figure 1 is a schematic front elevated view of a modular deck structure according to a preferred embodiment of the present invention, with some of the flagstones removed for clarity.

Figure 2 is a schematic partial exploded perspective view of the modular deck structure of Figure 1.

Figure 3 is a schematic perspective view of a plurality of modular deck structures as shown in Figure 1, assembled together for forming a deck with some of the flagstones removed for clarity.

Figure 4 is a schematic cross section view taken along line IV-IV in Figure 1.

Figure 5a is a schematic cross section view taken along line Va-Va in Figure 1.

Figure 5b is a schematic cross section view taken along line Vb-Vb in Figure 1.

Figure 6 is a schematic partial exploded perspective view of a modular deck structure according to another preferred embodiment embodying a liner within a cell of the present invention.

Figure 7 is a schematic cross section view taken along line VII-VII of figure 6 and when the flagstone is sitting on the liner of the cell.

Figures 8a to 8e are schematic side views of different variants of border planks according to the present invention, having different sloping portions.

Figures 9a and 9b are schematic side views of two flagstones according to the present invention, having different side edges.

Figure 10 is a schematic perspective view of a staircase made with modular deck structures according to the present invention.

Figure 11 is a schematic side view of the staircase of Figure 10.

Figure 12 is a schematic side view of a border plank according to the present invention, wherein a flagstone is sitting on the sloping portion of the border plank.

Figure 13 is a schematic side view of a border plank according to the present invention,  
5 wherein a flagstone is sitting on a shim.

While the invention will be described in conjunction with example embodiments, it will be understood that it is not intended to limit the scope of the invention to such embodiments. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included as defined by the appended claims.

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## DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description, similar features in the drawings have been given similar reference numerals and in order to weight down the figures, some elements are not referred to  
15 in some figures if they were already identified in a precedent figure.

Referring to Figures 1 and 2, each square modular structure (hereinafter called module) 2 has an open frame with interconnected crisscross planks 30, 32, 34 defining a plurality of polygonal cells 14. Each of the cells 14 has a top, a bottom and an inner wall 20 delimiting an  
20 opening in which a flagstone 24 is inserted to provide the flooring of the deck. Turning now also to figures 4, 5a, 5b, 7, 8a to 8e, 12 and 13, and in order to support the flagstone 24, the inner wall 20 has a sloping portion 26 flaring upwardly for supporting the side edges 28 of the flagstone. The flagstone 24 is sized and shaped to adjustably fit within the cell 14 and the side  
25 edges 28 are shaped to conform to the sloping portion 26 of the cell 14. Each of the flagstones 24 is thus allowed to sit properly on the sloping portion 26 of the cell 14.

In the illustrated case, the open frame 10 is made of treated wood, but other composite materials such as PVC, plastic, etc. can be used instead. The open frame 10 is composed of a

number of prefabricated interconnectable individual planks. It is also possible to use a pre-cast module already provided with a number of cells 14, which requires little or no assembly. The pre-cast module is more difficult to carry by car than individual planks.

5 The module 2 has a square shape perimeter defined by four border planks 30 connected end to end. To facilitate the connection of the border planks 30 and secure them together, there are pre-drilled holes at their extremities to easily fit bolts. It is also possible to have no pre-drilled holes, but in this case, the user has to drill the holes and fit the bolts himself.

10 The module of the present invention is not limited to a square shape as depicted in Figure 1. Other polygonal shapes for the perimeter of the module are also possible, such as a triangular shape, a narrow rectangular shape, etc. For example, if the module has a triangular shape perimeter, only three border planks 30 are needed. Each end of the border planks 30 has to be cut at a predefined angle for forming the desired shape once the border planks 30 are  
15 assembled together. That means that if a square shape is desired, each end of the border planks 30 must be cut at a 45° angle to fit the other end as to form a 90° angle once the two ends are assembled together.

Referring to figures 1, 2 and 6, in order to define the cells 14 which will receive the flagstones  
20 24, the interconnected crisscross planks are transverse planks 32 and cross planks 34. The two transverse planks 32 are installed within the perimeter in such a way that they extend across the same. The transverse planks 32 are used to separate the inside of the module 2 into three large cells. Six cross planks 34 are installed at right angle with the transverse planks 32 to form nine cells 14 ready to receive the flagstones 24. A number of cross planks 34 are  
25 extending between the border planks 30 and the transverse planks 32 while others are extending between the two transverse planks 32. The border 30, transverse 32 and cross 34 planks are forming the open frame 10 of the modular deck structure 2 according to the present invention.

30 Referring to Figure 4, for providing support to the transverse 32 and cross 34 planks, as well as the flagstones 24, each border plank 30 provides a part of the sloping portion 26 of the

inner wall 20 of the cell 14. In the illustrated case, each border plank 30 has a trapezoidal transversal cross section with parallel top 48 and bottom 50 edges. The top edge 48 is shorter in length than the bottom edge 50 because of the straight slanted inner edge providing the sloping portion 26. The outer edge 46 is at right angle with the bottom 50 and top 48 edges to enable the juxtaposition of another outer edge 46 of a border plank 30 of another module.

Referring to Figure 5a, each of the transverse planks 32 and each of the cross 34 planks has a similar trapezoidal transversal cross section. The top 48 and bottom 50 edges are substantially parallel with respect to each other. The top edge 48 is shorter in length than the bottom edge 50. Straight slanted side edges are providing the sloping portion 26 of the inner wall 20 of two adjacent cells 14.

Referring to Figure 5b, the transverse planks 32 and the cross planks 34 have a trapezoidal longitudinal cross section. Again, the top 48 and bottom 50 edges are substantially parallel with respect to each other. The top edge 48 is longer in length than the bottom edge 50. Slanted side edges 58 are complementary to the slopping portions 26 of the transversal cross section of any one of the transverse planks 32, the cross planks 34 and the border planks 30. As best shown in Figure 2, these side edges 58 are leaning on the respective slanted side edges of the border 30 and/or transverse 32 planks. There is no need to further fix the transverse 32 and cross 34 planks to each other or to the border planks 30 with bolts as they will be tightly sandwiched on each side by a flagstone 24 and will not be able to move from side to side and from top to bottom.

Referring to Figure 9a, there is shown a first embodiment comprising the flagstones 24 having a sloping shape on their side edges 28. The sloping shape is complementary to the sloping portion 26 of the inner wall 20 of the cells 14. These side edges 28 are needed to conform the flagstones 24 to the inner wall 20. Since the sloping portion 26 is flaring upwardly, it provides a strong support to the flagstones 24. To have a nice looking deck, the height of the flagstones 24 must be approximately of the same height as the slanted side edges in order for the top edges 48 of the flagstones 24 to be flush or a little higher than the top edges 48 of the border 30, transverse 32 and cross 34 planks.



Referring to Figures 6, 7, 9b, 12 and 13, there are shown a second and a third embodiment of the present invention using already available flagstones 24 to fit within the cells 14.

5 In the second embodiment, as shown in Figure 12, the flagstone 24 can be sitting directly on the sloping portion 26 of the inner wall 20. The side edge 28 of the flagstone 24 leans in a close-fitting manner against a vertical portion of the inner wall 20 and the flagstone 24 sits on a superior end of the sloping portion 26. Again, the sloping portion 26 drains water out of the border plank and prevents water accumulation between the side edge 28 of the flagstone 24  
10 and the inner wall 20.

In the third embodiment, as shown in Figures 6, 7, 9b and 13, a device to conform the side edges 28 of the flagstones 24 to the inner wall 20 of the cells 14 can be used. With this conforming device, the flagstones 24 can easily fit within the cells 14 while being supported  
15 by the inner walls 20. The device can be needed because since the side edges 28 of the flagstones 24 are generally perpendicular to the top and bottom ends 25, 27 of the flagstones 24, the flagstones 24 will not be supported by the inner walls 20. Keep in mind that it is the slanted side edges that provide support for the flagstones 24. Still, it is possible to insert the flagstone 24 within the cell 14 so that it will be supported, but the top edge 25 of the flagstone  
20 24 will not be flush with the top edges 48 of the border 30, transverse 32 and cross 34 planks. Furthermore, there will be gaps between the flagstone 24 and the inner wall 20.

Still according to the third embodiment, the device shown in Figures 6 and 7 is a liner 78 placed between the inner wall 20 of the cell 14 and the side edges 28 of the flagstone 24 for  
25 conforming the same together with the cell 14. Each liner 78 is lining the sloping portion 26 and has a back wall with the sloping shape 90 conforming to the sloping portion 26 of the inner wall 20 and a front wall having a ledge 94 extending around the opening for supporting one flagstone 24. Since the liner 78 is close-fitted with the inner wall 20 and due to its complementary sloping shape 90, it is supported by the inner wall 20. The flagstone 24 can  
30 easily be fitted within the cell 14 and be supported by the ledge 94 of the liner 78. The liner 78 is usually made of molded plastic, but again, other materials such as PVC, plastic, etc. can be

used with the same result.

Referring to Fig. 13, there is shown a fourth embodiment of the present invention also using already available flagstones 24 (as shown in Figs. 6, 7, 9b, 12 and 13) to fit within the cells 14.

5 The conforming device shown is a shim member 80 inserted in the cell 14. The shim member 80 is sized and shaped to properly sit on the inner wall 20 of the cell 14. The shim member 80 has a substantially horizontal support surface 82 for supporting a respective flagstone 24.

10 Unlike the shim member 80 shown in Fig. 13, the supporting surface 82 of the shim member 80 can cover the entire surface of cell 14. In this case, the shim member preferably has vertically pierced holes for evacuating water accumulated between the shim member 80 and the flagstone 24.

15 For better understanding, the inner wall 20 can be split in upper and lower sections. The lower section 84 is the surface of the inner wall 20 in contact with the shim member 80, while the upper section 86 is the surface of the inner wall 20 not in contact with the shim member 80. The upper section 86 conforms to the side edges 28 of the flagstones 24. The upper section can be vertical for conforming to the already available flagstones or it can be slanted to conform with the flagstone 24 (shown in figure 8c). The upper section 86 is approximately of  
20 same height as the side edges 28 for the flagstone 24 for the flagstone 24 to be flush with the top edges 48 of the planks. The shim member 80 conforms to the sloping portion of the lower section 84 of the inner wall 20. The shim member 80 can be made of plastic, wood, or other material strong enough for supporting the flagstone 24.

25 Referring to Figures 8a to 8e, there are shown other variants of sloping portions 26 for the border 30, transverse 32 and cross 34 planks that can be used for providing the inner wall 20 of the cells 14. The sloping portions 26 can be straight, curved, or a combination of different shapes. The slanted edges 58 of the longitudinal cross sections of both the transverse 32 and cross 34 planks have to be complementary to the sloping portion 26 of the border 30 planks.  
30 As can be appreciated, the sloping side edges 28 of the flagstones 24, as well as the sloping portion 90 of the back wall of the liner 78, have a complementary shape to the sloping

portions 26.

Referring to Figures 10 and 11, a staircase 64 according to the present invention is made of three narrow rectangular shaped modules, which are the steps 8. Two first step adjustments 68  
5 are used for supporting the first step of the staircase 64. String-boards 70 are used along the side of the staircase 64 to support the steps 8. String-board tighteners 72 are used to stiffen the structure. The joint between the upper end of the staircase and the module 2 of the deck is obtained by a string-board starter 74, thereby providing flexibility to the construction.

10 The step 8 does not have any cross planks 34, only three transverse planks 32 extending across the perimeter. Accordingly, in this case, the open frame is only composed of border 30 and transverse 32 planks.

Referring to Figure 3, there is shown an assembly of a number of modules 2, 5, 8  
15 interchangeable with each other and forming a deck structure 4 according to the present invention. Each module 2, 5 is raised off the ground by adjustable vertical supporting posts 6 mounted on deck blocks 3. Other types of supports can be used, such as regular supporting posts. However, the modules 2, 5 can be mounted directly on the ground as well.

20 In the illustrated case, there are steps 8, as well as a layout of square 2 and triangular 5 modules forming the deck 4 having a trapezoidal shape. Different layouts can be made by interchanging modules 2, 5, 8 of place or by adding or removing some of the modules. Even years after the deck construction is finished, it is always possible to add modules. Furthermore, it is very easy to do so.

25 Different sizes and shapes of flagstones 24 can be used. For example, rectangular flagstones are used for the steps 8, while both square and triangular flagstones are used for the triangular 5 module.

30 Advantageously, an assembly kit having all the components needed for building a module is available. The framing members are pre-cut and have predetermined lengths to allow the

construction of the open frame 10. Accordingly, there can be a kit for each different module. For example, there can be a kit for the triangular module 5, the square module 2, the rectangular module 8, etc. The flagstones are also part of the kit. For example, the kit for the triangular module 5 includes square and triangular flagstones. The kit for the narrow rectangular module 8, such as a step 8, includes narrow rectangular flagstones. The kit can be sold with already available flagstones 24 (as shown in Figs. 6, 7, 9b, 12 and 13), along with the liners 78 or the shim members 80, or with the specially designed flagstones 24 (as shown in Figs. 1, 2, 8a to 8e, 9a and 11). The kit saves storage space and is easier to deliver than a pre-cast module. In fact, the assembly kit can be easily carried by car.

Once the user has bought the kit, for example, the square module 2, the necessary steps for assembling the module 2 are very easy. First, the user has to connect the four border planks 30 end to end with bolts to define the perimeter of the open frame 10. Once this is done, and that a square perimeter is formed, the user has to install the two transverse planks 32 within the perimeter so that they extend in parallel with respect to each other and that they are extending across the perimeter.

If the user has done everything right so far, the two transverse planks 32 slanted side edges 58 are now supported by the slanted inner edges of the border planks 30. The distance between the two transverse planks 32 is irrelevant at this stage. Actually, since the next step is to place the cross planks 34 within the perimeter to form the nine cells 14 of the module 2 and that in order for the cross planks 34 to tightly fit between the transverses planks 32, the user will have to adjust the distance between the transverse planks 32 manually until the cross planks 34 fit between the two. The user will have to do the same adjustment to fit the cross planks between the transverse planks 32 and the border planks 30. The nine cells 14 are now created and the cross planks 34 are supported by the slanted side edges of the transverse planks 32 and/or the border planks 30.

Once the open frame is assembled, if the user is not using any liners 78 or shim members 80, the flagstones 24 of the first and second embodiments can be easily fitted within the cells. If liners 78 or shim members 80 are used, they must be placed within the cells 14 and the

flagstones 24 of the third and fourth embodiments have to be placed within the cell 14 and so that they are supported by the liners 78 or the shim members 80. The assembly of the module 2 is then completed and it can be installed on the supporting posts 6 if desired.

- 5 Although preferred embodiments of the present invention have been described in detail herein and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to these precise embodiments and that various changes and modifications may be effected therein without departing from the scope or spirit of the present invention.